

Effect of litter type on digestive tract and accessory organ in the native chicken

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Abstract. This research was aimed to study the size of digestive tracts and digestive organs, as well as accessory organs in the digestive system of native chickens under different litter materials. One day old Kampung Unggul Balitnak (KUB) chicken as many as 108 unsexed birds were randomly placed into three treatment groups of different litter materials, namely rice hulls, wood shavings, and corn cobs mills. Data collected included the final body weight (g/bird), relative weight (%) and length of the digestive tract (cm), digestive organs, and accessories organ of the digestive system. Relative weight (%) measurements include the digestive tract, esophagus, crop, proventriculus, gizzard, small intestine, duodenum, jejunum, ileum, caeca, large intestine, and accessory organs. The accessory organ consists of the liver, gallbladder, and pancreas. Length measurements include the small intestine, duodenum, jejunum, ileum, caeca, and large intestine. Furthermore, the relative weight (%) is calculated for each segment of the digestive tract and accessory organs. Data were analyzed using variance analysis, followed by Duncan's New Multiple Range Test using the SPSS version 16.0 application. The results showed that the different litter material had no effect on the relative weight (%) of the digestive tract, digestive organs, and accessory organs, except the proventriculus and caeca ($P < 0.05$). The litter material has no effect on the entire length of the digestive tract, small intestine, duodenum, jejunum, ileum, caeca, and large intestine. The highest relative proventriculus weight is found in chickens given wood shavings litter and the lowest on corn cobs. The highest relative caeca weight is found in chickens given wood shavings litter. There is no difference in the weight of caeca between chickens given rice hulls and corn cobs litter.

1. Introduction

Chicken maintenance under litter floor systems affects the behavior of chicken. Foraging is higher than the feeding behavior (25 vs 18%) on the litter floor system [1], thus allowing the litter material consumed by the chickens and affect the digestive process. The chicken digestive process occurs in the digestive tract with the help of accessory organs. Therefore, the condition of the gastrointestinal tract and accessory organs important in determining the performance of chicken. Coarse fibers, in general, can increase the relative weight of the digestive tract, depending on the fiber content is contained and measured organ [2]. Wood shavings as litter material have a fiber content higher than the rice hulls and corn cobs (28.20 vs. 25.50 vs. 20.10%) [3].

2. Material and Methods

2.1. Material

This study used one-day old Kampung Unggul Balitnak (KUB) chicken as many as 108 unsexed birds emanating from the Livestock Research Center of the Ministry of Agriculture, Ciawi, Bogor, Jawa Barat. The tools used in this study were hanging scales, analytical scales, knife, scalpel, and ruler. A WeiHeng hanging scales with a precision of 10 g and a capacity of 50 kg used to weigh the chickens. An analytical Camry EHA501 with a precision of 0.01 g and a capacity of 100 g used to weigh the digestive tract, digestive organs, and accessory organs. The knife used to slaughter chickens. Scalple used to cut a segment of the gastrointestinal tract, digestive organs, and separate the accessory organ. The ruler is used to measure the length of the gastrointestinal tract.

2.2. Methods

Chicken maintenance is done in Technical Implementation Unit (UPT) Regional Extension Agency for Agriculture, Food and Fisheries V, Sleman Regency, Pakem District for 84 days. Data collection was performed at the Laboratory of Poultry Science, Faculty of Animal Science, Universitas Gadjah Mada, Yogyakarta. One-day-old Kampung Unggul Balitnak (KUB) chicken as many as 108 unsexed birds were initially weighed and identified using wing web. The experimental design used was completely randomized design [4] which consists of three treatments that three different litter material (wood shavings, rice hulls, corn cobs). Each treatment repeated three times with a density of 12 birds / m². The size of the pen is 1 m x 1 m x 2.5 m. The feed given during maintenance has 16.76% of CP and 2958.21 kcal/kg of ME [5].

Slaughtering is done at the age of 84 days is permitted in accordance with Malaysian Protocol for the Halal Meat and Poultry Production [6] against nine chickens that come from each cage. Data collected include final body weight (g/bird), the relative weight (%), and the length of the gastrointestinal tract (cm), digestive organs, and accessory organs of the digestive system. Chicken body weight was taken before slaughter, and the relative weight of organs stated percentage of live weight [4]. Measurements include the relative weight of the digestive tract, esophagus, crop, proventriculus, gizzard, intestine, duodenum, jejunum, ileum, caeca, colon, and accessory organs. Accessory organs consisting of liver, gallbladder, and pancreas. Measurements include the length of the small intestine, the duodenum, jejunum, ileum, caeca, and large intestine. Data were analyzed using variance analysis, followed by Duncan's New Multiple Range Test using the SPSS version 16.0 application

3. Results and Discussion

Statistical analysis showed that only the relative weight of proventriculus and caeca (%), which has a significant difference ($P < 0.05$) between treatments. The length of the digestive tract (gastrointestinal tract / GIT) and each of the digestive organs did not differ significantly ($P > 0.05$) between treatments.

The highest weight of the proventriculus is found in chickens reared with wood shavings litter because wood shavings have the higher fiber content than the rice hulls and corn cobs (28.20 vs. 25.50 vs. 20.10 %) [3]. Additionally, wood shavings have a fraction of insoluble fiber, namely cellulose, hemicellulose, and lignin [7] with high levels (cellulose: 40-45%; hemicellulose: 20-30%; lignin: 30% of DM) [8] rather than rice hulls (cellulose: 32.67%; hemicellulose: 31.68%; lignin: 18.81% of DM) [8], and corn cobs (cellulose: 38.8%; hemicellulose: 44.4%; lignin: 11.9% of DM) [9]. Therefore, the wood shavings longer accumulate in the gizzard and increase the activity of grinding [7], increasing the retro-reflux, and proventriculus stimulated to secrete more hydrochloric acid. As a result, the proventriculus of chicken maintained in wood shavings litter is more developed.

Table 1, Body weight (g) and the relative weight (%) of native chicken digestive tract aged 84 days on maintenance under different litter material

	Rice hulls	Wood shavings	Corn cob
Body weight ^{ns}	976.67 ± 89,49 ^a	1091.70 ± 74,74 ^a	1127.00 ± 57,03 ^a
GIT (%) ^{ns}	10.37 ± 1,63 ^a	9.48 ± 1,98 ^a	10.06 ± 2,51 ^a
Esophagus (%) ^{ns}	0.25 ± 0,09 ^a	0.35 ± 0,07 ^a	0.35 ± 0,16 ^a
Crop (%) ^{ns}	0.60 ± 0,32 ^a	0.49 ± 0,50 ^a	0.39 ± 0,23 ^a
Proventriculus (%) [*]	0.45 ± 0,05 ^{ab}	0.52 ± 0,05 ^b	0.41 ± 0,04 ^a
Ventriculus (%) ^{ns}	5.07 ± 0,39 ^a	4.35 ± 0,70 ^a	4.57 ± 0,73 ^a
Small intestine (%) ^{ns}	2.09 ± 0,83 ^a	2.44 ± 0,99 ^a	2.84 ± 0,99 ^a
Duodenum (%) ^{ns}	0.54 ± 0,13 ^a	0.56 ± 0,07 ^a	0.59 ± 0,06 ^a
Jejunum (%) ^{ns}	1.34 ± 0,21 ^a	1.25 ± 0,41 ^a	1.05 ± 0,06 ^a
Ileum (%) ^{ns}	0.99 ± 0,17 ^a	0.86 ± 0,07 ^a	0.80 ± 0,22 ^a
Ceca (%) [*]	0.48 ± 0,09 ^a	0.80 ± 0,07 ^b	0.53 ± 0,06 ^a
Large intestine (%) ^{ns}	0.24 ± 0,08 ^a	0.24 ± 0,06 ^a	0.15 ± 0,04 ^a

(*) Significant or significantly different (P <0.05) between treatments,
 (ns) Non-significant or not significant (P > 0.05) between treatments,
 (a, b) of different superscript letters in the same row indicate significant differences (P <0.05)

Table 2, The mean length of the small intestine, caeca, and colon (cm) of native chicken aged 84 days on maintenance under different litter material

	Rice hulls	Wood shavings	Corn cob
GIT (cm)	101.93 ± 24,46 ^a	131.93 ± 12,32 ^a	124.97 ± 17,19 ^a
Small intestine (cm) ^{ns}	79.20 ± 8,23 ^a	90.43 ± 24,10 ^a	72.17 ± 9,45 ^a
Duodenum (cm) ^{ns}	15.30 ± 0,85 ^a	19.27 ± 3,35 ^a	16.00 ± 2,04 ^a
Jejunum (cm) ^{ns}	39.10 ± 1,15 ^a	42.67 ± 11,69 ^a	31.33 ± 6,41 ^a
Ileum (cm) ^{ns}	31.80 ± 4,66 ^a	35.67 ± 4,05 ^a	32.17 ± 8,22 ^a
Caeca (cm) ^{ns}	21.40 ± 1,11 ^a	23.33 ± 3,30 ^a	22.10 ± 0,75 ^a
The large intestine (cm) ^{ns}	7,13 ± 1,50 ^a	7.40 ± 1,23 ^a	7,29 ± 1,20 ^a

(*) Significant or significantly different (P <0.05) between treatments,
 (ns) Non-significant or not significant (P > 0.05) between treatments,
 (a, b) of different superscript letters in the same row indicate significant differences (P <0.05)

The highest weight of caeca found in chickens reared in wood shavings litter caused by the level of insoluble fiber higher than soluble fiber contained in wood shavings (18.68 vs 2.73%, of the total crude fiber 21.41% DM) [11]. Effect of insoluble fiber that can increase the passage rate and produce lower digesta viscosity than soluble fiber [12] is believed to cause compliance with the characteristics of the material contained in the caeca, which has low viscosity [13]. As a result, the amount of fermentable material into the caeca more, increased microbial fermentation and caeca function, as well as the optimal fermentation, so the caeca become more developed.

Weight of the pancreas, liver, and gall bladder of chicken in three treatments did not differ significantly, due to the voluntary nature of the work. The secretion of enzymes by the pancreas and bile salt secretion by the liver occurs when the substrate is found only in accordance with enzymes and bile salts are produced. Therefore, a material that contains a lot of litter inedible crude fiber does not affect the pancreas and liver work so it does not undergo hypertrophy.

Table 3. Relative weight (%) of accessory organs of the digestive tract in native chicken aged 84 days on maintenance under different litter material

	Rice hulls	Wood shavings	Corn cob
Pancreas ^{ns}	0.21 ± 0,08 ^a	0.19 ± 0,01 ^a	0.17 ± 0,10 ^a
Liver ^{ns}	1.92 ± 0,18 ^a	2.24 ± 0,19 ^a	1.91 ± 0,13 ^a
Gal bladder ^{ns}	0.05 ± 0,05 ^a	0.07 ± 0,01 ^a	0.10 ± 0,06 ^a

(*) Significant or significantly different (P <0.05) between treatments,

(ns) Non-significant or not significant (P > 0.05) between treatments,

(a, b) of different superscript letters in the same row indicate significant differences (P <0.05)

4. Conclusion

Based on these results it can be concluded that: litter material does not affect the relative weight (%) and length of the gastrointestinal tract (cm); litter material affects the relative weight of the proventriculus and caeca (%); litter material does not affect the relative weight of accessory organs in the digestive system chickens (%).

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